

Wireless Notice Board Using Bluetooth

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Abstract

In modern digital environments, traditional notice boards are inefficient due to manual updating and limited accessibility. This paper presents a Wireless Electronic Notice Board System that allows users to update messages wirelessly via voice commands using a mobile application. The system integrates Bluetooth communication, voice-to-text conversion, and microcontroller-controlled message display, making it suitable for educational institutions, offices, public facilities, and information centers.

Users speak the message into the AMR Voice Android application, which converts speech into text using Google's speech recognition technology. The text is transmitted via an HC-05 Bluetooth module to an Arduino UNO microcontroller, which displays the message on a 16×2 LCD. For messages exceeding the display area, an auto-scrolling feature ensures full readability.

The proposed system is low-cost, efficient, and user-friendly, offering hands-free operation while reducing manual effort and paper usage. It demonstrates the potential for smart communication tools that bridge traditional methods with modern embedded and wireless technologies.

Introduction

Wireless communication has become a key component of modern commercial and academic applications over the past decade. With mobile subscriptions surpassing wired connections, low-cost, low-power, short-range wireless communication—such as personal wireless networks—has gained significant attention. Advances in embedded systems and communication technologies have enabled the integration of computational processing, wireless communication, and other functionalities into compact and cost-effective devices. These devices have applications ranging from industrial automation to homeland security, enabling tailored solutions for information dissemination and monitoring. As such, engineers with expertise in embedded systems and wireless communication are increasingly in demand.

Communication plays a critical role in the efficient functioning of institutions such as schools, offices, and public facilities. Traditional notice boards, while widely used, require manual updating, which is time-consuming, inflexible, and inefficient. The integration of wireless and embedded technologies

presents an opportunity to modernize these boards, making updates faster, more convenient, and interactive.

This project proposes a **Wireless Electronic Notice Board System** that allows real-time message updates via Bluetooth using voice input through a mobile application. Users speak into the AMR Voice Android app, which converts speech into text using Google's speech recognition. The text is transmitted wirelessly via an HC-05 Bluetooth module to an Arduino UNO microcontroller, which displays the message on a 16×2 LCD. To accommodate longer messages, an **auto-scrolling feature** ensures the full text is visible.

The system is designed to be **user-friendly, cost-effective, and portable**, making it accessible to non-technical users. The voice-based interface promotes **hands-free and contactless operation**, particularly beneficial in environments where hygiene or rapid communication is important, such as hospitals or classrooms.

From a technical perspective, this project demonstrates the integration of hardware and software, including microcontroller programming, serial communication, and mobile app interaction. Furthermore, it serves as a foundation for advanced smart display systems, potentially incorporating IoT connectivity, cloud-based updates, multi-language support, scheduling, and remote monitoring.

Aim of the Project

The main goal of this project is to design and implement a **smart, wireless notice board system** that leverages Bluetooth communication and voice recognition to display real-time messages on an LCD screen using an Arduino-based platform.

Specific Aims:

- **Wireless Communication:** Establish a seamless Bluetooth connection between a smartphone and the noticeboard for message transmission.
- **Voice-to-Text Conversion:** Use the AMR Voice app to convert spoken messages into text for display.
- **Real-Time Display:** Show messages immediately on the LCD screen.
- **Auto-Scrolling Feature:** Ensure long messages are fully visible via scrolling.
- **Cost-Effective Design:** Use affordable, readily available components (Arduino UNO, HC-05, 16×2 LCD).

- **Hands-Free Operation:** Enable users to update notices without physical interaction. This approach aligns with the trend toward smart infrastructure, demonstrating how traditional communication tools can be enhanced using embedded systems and mobile technologies.

Motivation

Manual updating of noticeboards in institutions and public places is time-consuming and inefficient. The motivation for this project includes:

- Providing a wireless, hands-free notice update system.
- Reducing paper wastage and promoting sustainability.
- Making communication accessible, fast, and modern.
- Allowing non-technical users, such as teachers or administrators, to update notices using voice commands.

Objectives

- Design a low-cost, user-friendly wireless notice board.
- Interface the HC-05 Bluetooth module with Arduino UNO.
- Enable voice-to-text message input through the AMR Voice app.
- Implement auto-scrolling for long messages on a 16×2 LCD.
- Demonstrate real-time, efficient notice communication.
- Ensure accessibility for users with minimal technical knowledge.

Literature Review

Prior studies explored GSM, Bluetooth, and Wi-Fi-based notice boards:

- **GSM-based systems** (S. Rajitha & K. Sri Rama Krishna, 2014) allowed SMS messages but incurred recurring SIM costs and lacked voice support.
- **Bluetooth-based systems** (J.S. Jadhav & Aniket S. Lokhande, 2015) enabled typed text transmission but were limited to manual input.
- **Voice-controlled boards** (Prashanth P.R. & Naveen Kumar S., 2017; K. Manikandan & G. Sathya, 2018) lacked efficient handling of long messages.
- **IoT-enabled boards** (V. Praveen Kumar & G. Ram Mohan, 2018) offered cloud integration but required continuous internet access.

The proposed system addresses these gaps by combining **voice input, Bluetooth connectivity, and auto-scrolling** in a low-cost, portable solution suitable for real-time applications.

Software and Hardware Requirements

This chapter discusses the **software and hardware requirements** for the implementation of a **Wireless Voice-Enabled Notice Board** using Bluetooth HC-05. The system combines Arduino-based microcontroller programming with a mobile app interface to enable wireless voice-controlled message display on an LCD.

Software Requirements

The software environment provides tools for writing, compiling, and uploading the source code to the Arduino microcontroller. Key software components include:

- **Arduino IDE:** A cross-platform application for Windows, macOS, and Linux that allows code development and uploading to Arduino boards.
- **AMR Voice App:** An Android application developed using the MIT AI2 Companion platform. It enables voice-to-text conversion and sends commands via Bluetooth to the Arduino.



Fig 1 Arduino UNO



Fig 2 An A-to-B USB Cable

Arduino IDE Setup

1. **Driver Installation:**

- Connect the Arduino board to a computer via USB.
- If Windows identifies the device as “Unknown,” update the driver manually by selecting the ArduinoUNO.inf file from the IDE’s Drivers folder.

2. **Testing the Board:**

- Open the **Blink example** from File > Examples > 1.Basics > Blink.
- Select the board type: Tools > Board > Arduino UNO.
- Select the appropriate COM port: Tools > Port > COMxx.
- Upload the program; the onboard LED should start blinking, indicating successful programming.

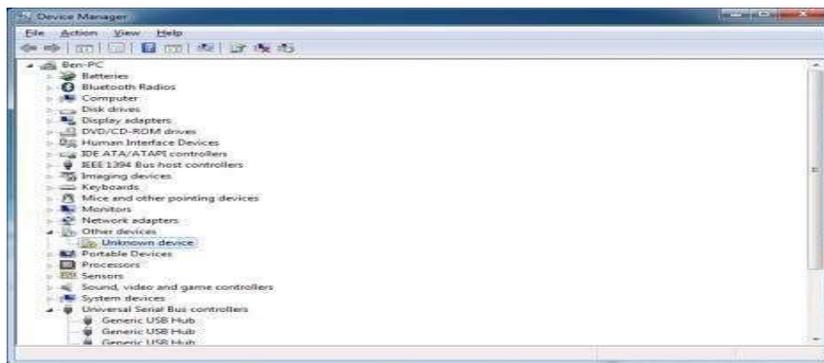


Fig 3 : Unknown Device Listed in Device Manager

- Right click on the “Arduino UNO (COMxx)” or “Unknown Device” port and choose the “Update Driver Software” option
- Next, choose the “Browse my computer for Driver software” option

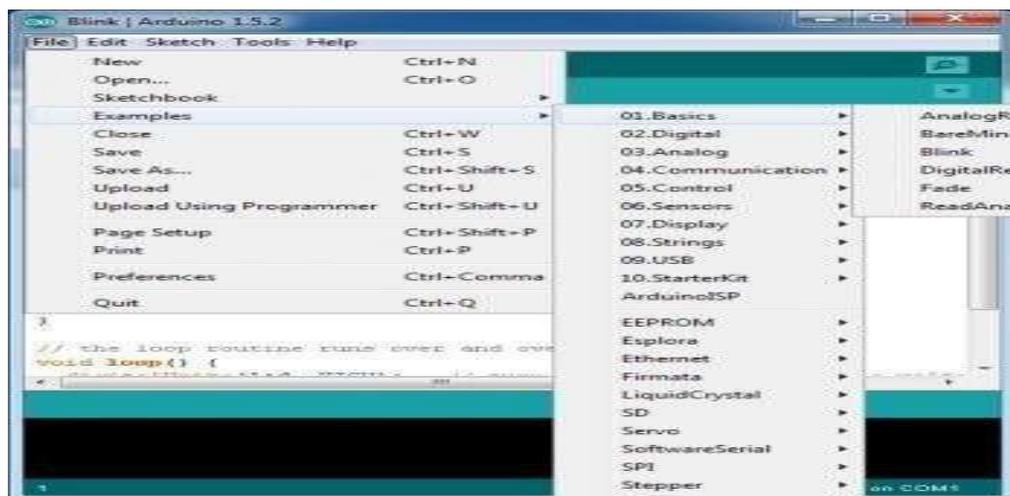


Fig 4 Arduino IDE Menu Showing Example Sketches

- Select the type of Arduino board you’re using: Tools > Board > your board type

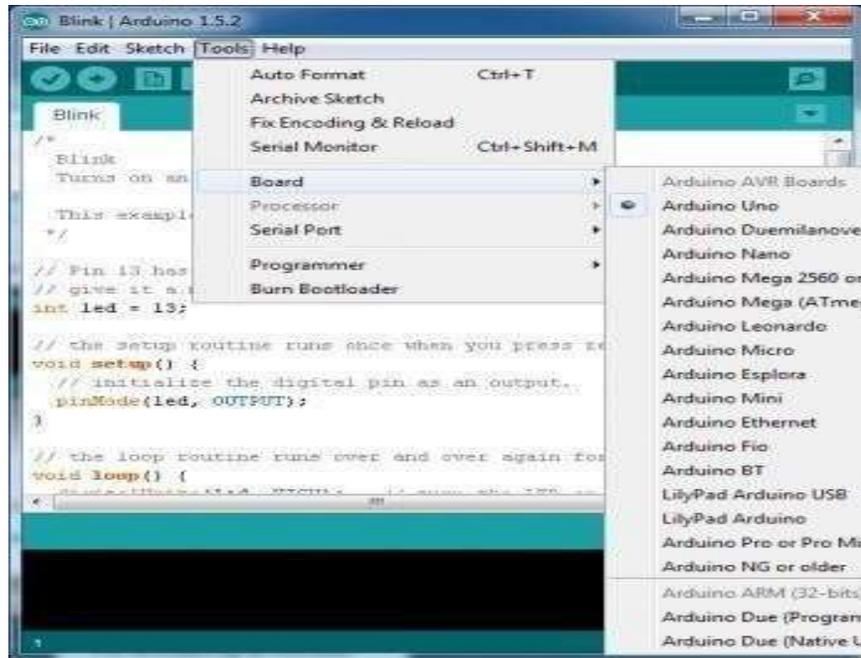


Fig 5 Arduino IDE Menu Showing Tools for board selection

- Select the serial/COM port that your Arduino is attached to: Tools > Port > COMxx

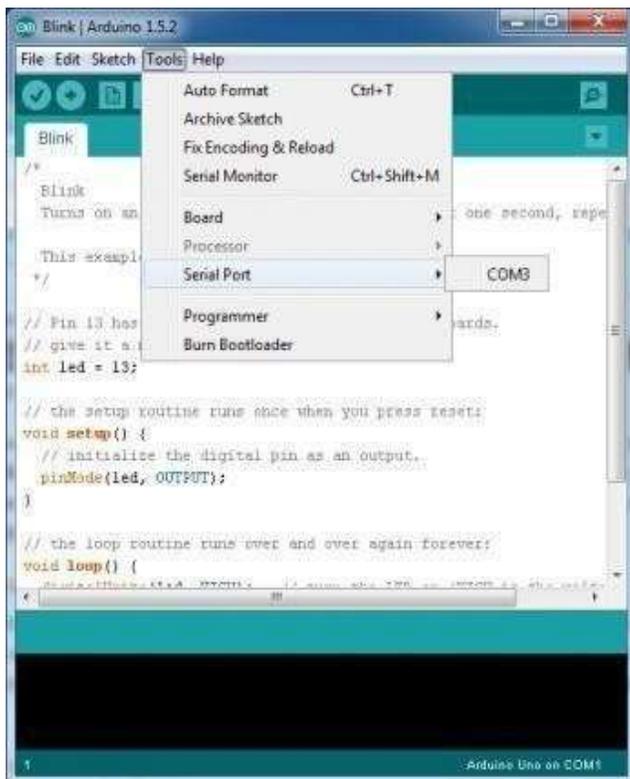


Fig 6 Arduino IDE Menu Showing Tools for serial port

- If you're not sure which serial device is your Arduino, take a look at the available ports, then unplug your Arduino and look again. The one that disappeared is your Arduino.

- With your Arduino board connected, and the Blink sketch open, press the 'Upload' button

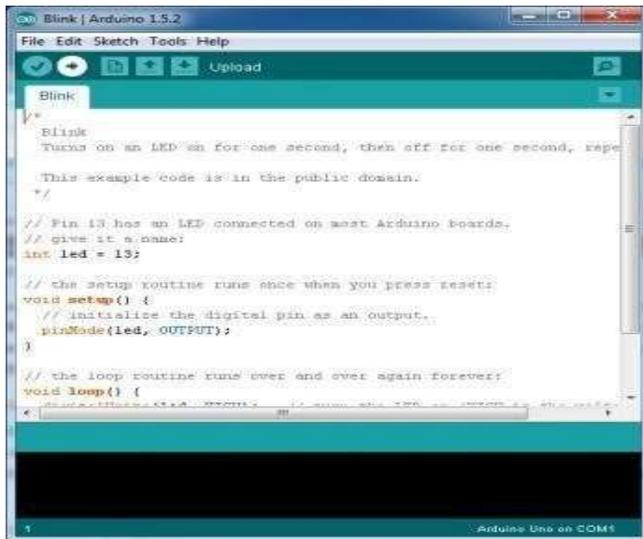


Fig 7 Blink Example Code Loaded in Arduino IDE

AMR Voice App Functionality

The AMR Voice app provides wireless control of devices using Bluetooth and voice commands. Key features include

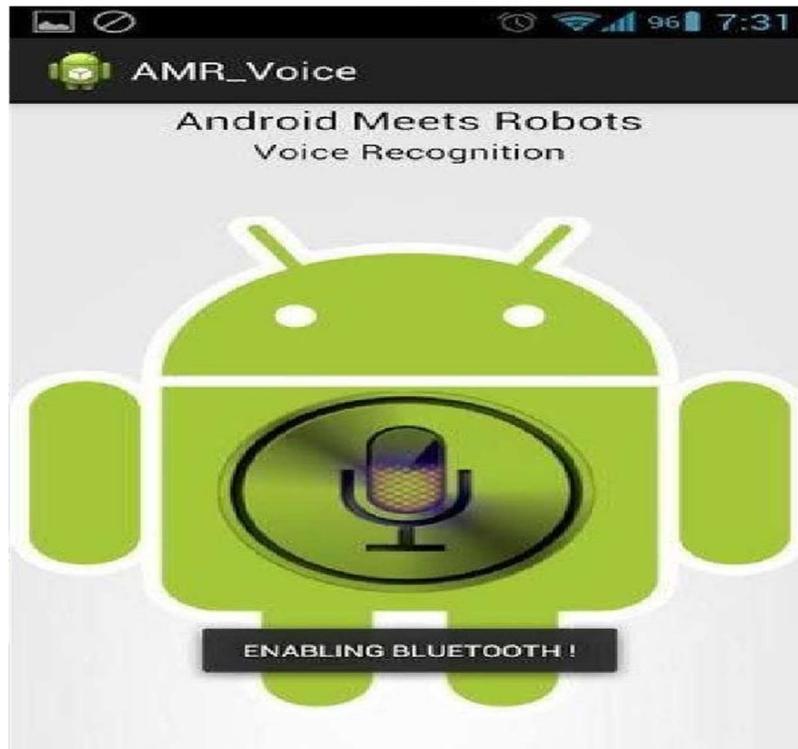


Fig 8 AMR VOICE App Interface for Voice-Controlled Bluetooth Communication

- **Bluetooth Communication:** Establishes a wireless connection between a smartphone and the Arduino.
- **Voice Recognition:** Converts spoken input into actionable commands.
- **Control Methods:** Users can interact via app buttons or voice commands.
- **Customization:** Voice commands can be tailored for specific actions.

- **Hands-Free Operation:** Enables control without manual intervention, useful in classrooms or public spaces.

Use Cases: Robots, home automation, and general device control via voice commands.

2.3 Hardware Requirements

The hardware components for the project include:

- **Arduino UNO:** A microcontroller board based on the ATmega328P with 14 digital I/O pins (6 PWM), 6 analog inputs, 16 MHz clock, USB interface, and power jack.

- **HC-05 Bluetooth Module:** Enables short-range wireless communication with smartphones.
- **16×2 LCD Module:** Displays messages; supports both 4-bit and 8-bit communication modes.
- **MAX232 IC:** Converts TTL logic signals from Arduino to RS-232 voltage levels for serial communication.
- **Power Supply:** Provides regulated 5V DC power for the system.
- **Miscellaneous Components:** Jumper wires, resistors, and connectors for interfacing.



Fig 9 ARDUINO UNO

Arduino UNO Features

11 Features of Microcontroller

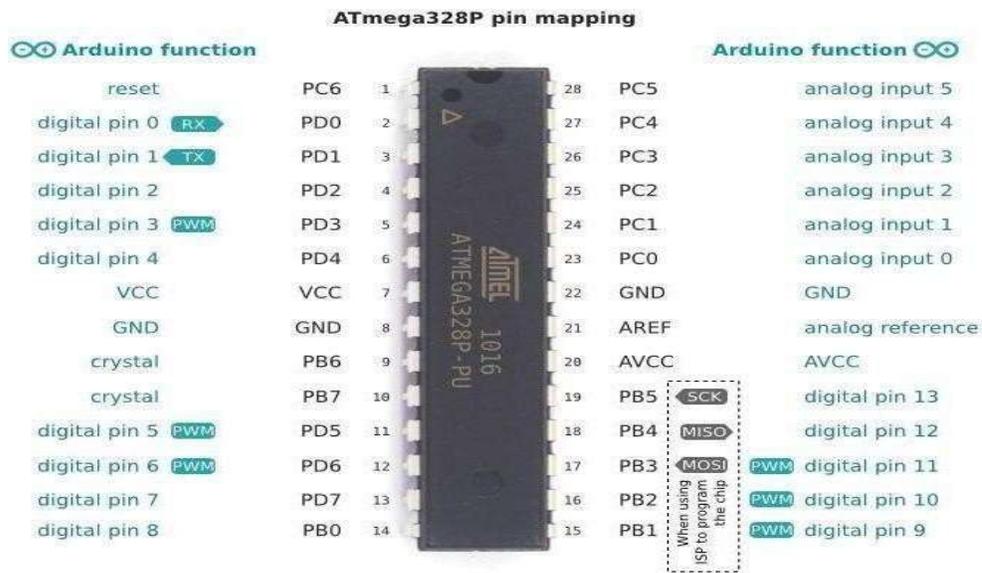


Fig 10 At mega pin mapping

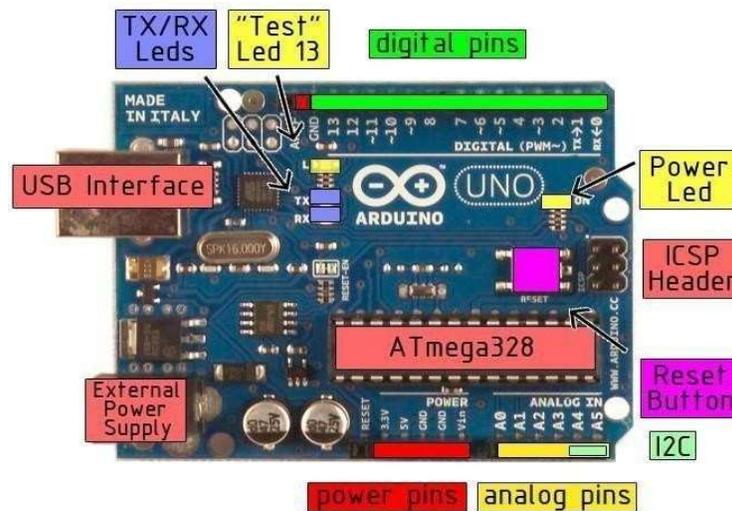


Fig 11 Arduino pins

LCD Module Overview

The 16×2 LCD consists of **two lines with 16 characters per line**. It uses:

- **Data Pins (D0–D7):** Transmit characters and commands.
- **Control Pins (RS, RW, EN):** Manage command/data selection and read/write operations.
- **Backlight Pins (A, K):** Power the backlight for visibility.

The LCD operates in either **4-bit or 8-bit mode**; 8-bit mode allows faster updates, whereas 4-bit mode reduces the number of data lines used.

Bluetooth Architecture

Bluetooth operates in a **master-slave configuration** within ad-hoc networks called **piconets**, supporting up to seven active slave devices per master. Multiple piconets can form a **scatternet**, allowing devices to participate in multiple networks. Key features include robustness, low power consumption, and short-range communication suitable for personal area networks.

MAX232 and RS-232 Communication

The MAX232 IC converts TTL logic levels from Arduino to RS-232 voltage levels for serial communication. Data is transmitted in **frames** with a start bit, data bits (LSB first), optional parity, and stop bit(s).

Wireless Notice Board Using Bluetooth

This chapter presents the design, methodology, and implementation of a **Wireless Notice Board** using a Bluetooth HC-05 module. The system enables real-time display of notices through **voice commands** via an Android mobile application, addressing the limitations of conventional and internet-dependent digital notice boards.

Existing System

Traditional notice boards are widely used in schools, colleges, offices, hospitals, and public transport areas to display announcements or instructions. These boards are primarily **manual**, requiring physical updates, which are labor-intensive and slow. Digital noticeboards with LED or microcontroller interfaces have emerged, relying on **wired or internet-based communication**. However, they present several challenges:

- **Manual Operation:** Updates require physical presence and effort.
- **Wired Connectivity:** Some systems require USB or LAN connections.
- **Limited Remote Access:** Updates cannot be performed from a distance without network access.
- **Internet Dependency:** IoT-enabled boards require stable Wi-Fi or cellular connectivity, unsuitable for remote areas.
- **No Voice Control:** Lack of hands-free operation limits accessibility.
- **Limited Readability:** Long messages may not display properly on small screens without scrolling. These limitations reduce the efficiency, accessibility, and adaptability of existing noticeboard systems, especially in environments requiring frequent or urgent updates.

Proposed System

The proposed system introduces a **wireless, voice-**

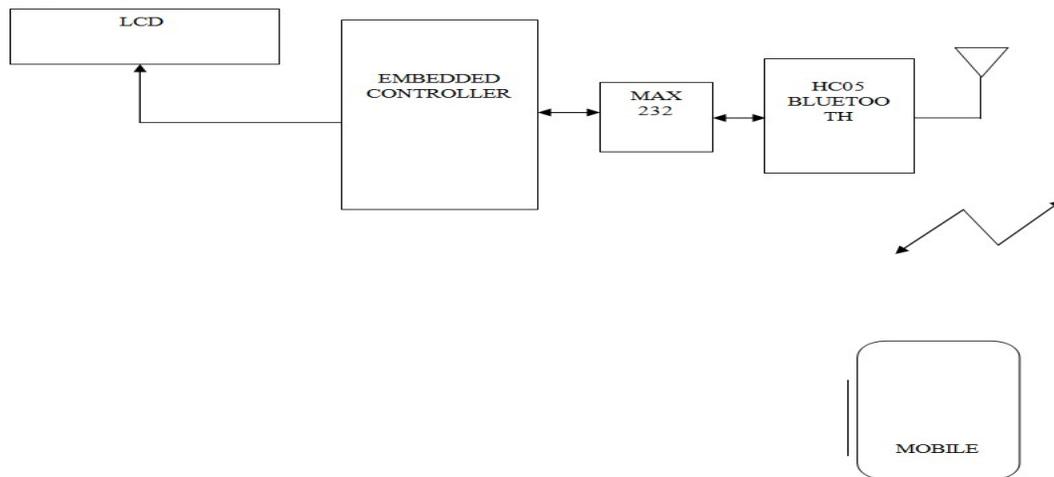


Figure 12: Block Diagram of Wireless Notice Board

controlled notice board using Bluetooth technology. It integrates an **Android app with voice-to-text functionality** and a 16×2 LCD with auto-scrolling capability, addressing the shortcomings of prior systems.

System Design Overview

The system consists of two primary modules:

A. Input Module (Mobile App + Voice Recognition)

- The user speaks into the **AMR Voice App** on an Android smartphone.
- The app converts speech to text using the **Google Speech API**.
- The resulting text is transmitted via **HC-05 Bluetooth** to the microcontroller.
-

B. Processing & Display Module

Steps in the Block Diagram:

1. **Voice Input via Mobile (AMR Voice App):** Speech is captured and converted to text.
2. **Bluetooth Communication (HC-05):** Text is transmitted wirelessly to the HC-05 module, operating in **slave mode** via UART protocol.
3. **Signal Level Conversion (MAX232):** Converts RS-232 voltage levels from HC-05 to TTL logic compatible with Arduino.
4. **Data Processing (Arduino UNO):**
 - Receives converted text.
 - Identifies message length and determines whether auto-scrolling is needed.
5. **Message Display (LCD):** Text is displayed on a 16×2 LCD with auto-scrolling for long messages.

Advantages

The wireless notice board system offers several advantages over conventional manual and semi-digital boards. By using Bluetooth technology, it

- The **HC-05 module** receives text and forwards it to the **Arduino UNO** microcontroller.
-
- The Arduino stores and processes the message, displaying it on the **16×2 LCD**.
- For messages exceeding 16 characters, an **auto-scrolling function** ensures full visibility.

Proposed System Workflow

1. Open the AMR Voice App on an Android device.
2. Speak the notice into the app.
3. Convert speech to text and send it via Bluetooth.
4. HC-05 receives the message and transmits it to the Arduino.
5. Arduino:
 - Stores and interprets the message.
 - Scrolls long messages smoothly from right to left.
6. LCD continuously displays the latest message until a new one is received.

eliminates the need for physical wiring or internet connectivity, making installation and maintenance straightforward. Bluetooth modules, such as the HC-05, consume very little power, allowing for energy-efficient operation and suitability for battery-powered setups. The system is cost-effective since components like the Arduino microcontroller and Bluetooth modules are inexpensive, and no recurring internet charges are required. Updates can be made remotely through a smartphone or laptop, removing the need for manual writing or printing, which significantly reduces effort and paper usage. Its compact and portable design, due to minimal wiring requirements, allows easy relocation, making it ideal for temporary events, classrooms, workshops, or hostels. The system supports localized communication since the Bluetooth range of 10–30 meters restricts updates to nearby authorized users, enhancing security. Integration

with voice-to-text apps or custom mobile applications enables hands-free operation, which is particularly useful for visually impaired users or fast-paced environments. The system ensures real-time updates and reliable message display within small areas, making it well-suited for schools, colleges, offices, and residential campuses.

Disadvantages

Despite these advantages, there are certain limitations. The short-range nature of Bluetooth can restrict usability in large buildings or campuses, and physical obstacles or interference can further reduce effective communication. Operating on the crowded 2.4 GHz frequency band, Bluetooth may experience interference from devices such as Wi-Fi routers, microwaves, or cordless phones. While the data transfer rate is sufficient for text-based messages, it may not accommodate multimedia content or large data files efficiently. Security concerns arise as Bluetooth connections are susceptible to eavesdropping, unauthorized access, and spoofing if proper encryption is not implemented. Device compatibility issues may occur due to different Bluetooth versions and profiles, leading to potential pairing failures. Standard Bluetooth modules, although low-power, still consume more energy during continuous operation, which may require frequent battery replacement in portable setups. Most modules are designed for one-to-one communication, complicating broadcasting to multiple boards simultaneously, and initial device pairing can be cumbersome in environments with multiple users.

Applications

The applications of this system are extensive across educational, corporate, healthcare, public, and residential environments. In educational institutions, schools, colleges, and universities can use the system to display exam schedules, class cancellations, and event updates, efficiently communicating across classrooms and departments. In offices, the notice board can broadcast reminders, meeting schedules, and emergency alerts without printed circulars, enabling real-time updates. Hospitals and clinics can place the boards in waiting areas or departments to display queue numbers, health tips, and emergency announcements, improving communication efficiency. Public transport stations, such as bus stops or small railway stations, can use these boards to provide arrival and departure times, delays, or route changes from a nearby control room. Retail outlets, shopping malls, and stores can display offers, event notifications, or directional information, updated instantly via mobile devices. During exhibitions, trade fairs, and conferences, organizers can provide session schedules, speaker details, and venue changes without needing physical updates. Government offices and municipal buildings can keep citizens

informed about operational timings, announcements, and queue numbers, while hostels and residential campuses can display mess schedules, visitor information, and safety instructions remotely.

Results and Discussion

This chapter presents the results and discussion of the wireless notice board system implemented using Bluetooth communication. The system is designed to enable wireless display of messages, offering a modern alternative to traditional notice boards.

System Operation

The wireless notice board system operates by receiving messages sent from Bluetooth-enabled devices, such as smartphones or laptops. The core of the system is a microcontroller—commonly an Arduino Uno, NodeMCU, or equivalent—which controls the overall operation. Communication is facilitated via a Bluetooth module, typically the HC-05 or HC-06. The display component can be an LCD (Liquid Crystal Display) or an LED matrix, depending on the required output format. Power is supplied through a DC source or battery, with voltage regulation ensuring stable operation.

The user first pairs their mobile device with the Bluetooth module, a process that is usually required only once, as the module stores pairing information. Once paired, messages are transmitted wirelessly using a serial Bluetooth terminal application or a dedicated Android app. The Bluetooth module receives the data and forwards it to the microcontroller through its RX (receive) and TX (transmit) pins.

The microcontroller continuously monitors for incoming data. Upon receiving a message, it temporarily stores the data, processes it, and converts it into a display-compatible format. For LCDs, the text is formatted into multiple lines, with appropriate commands handling line breaks and alignment. For LED matrices, characters are translated into pixel patterns and scrolled across the screen.

The displayed message remains active until a new message is received, at which point it is replaced. Advanced implementations may include a real-time clock (RTC) or memory storage to retain messages during power interruptions. Additionally, some systems may incorporate buttons for manual reset or automated message updates at fixed intervals.

Overall, this system offers a cost-effective, wireless solution for short-range communication, suitable for environments such as schools, offices, and hostels where frequent message updates are required without physical intervention.

The wireless notice board system was successfully implemented and tested. The setup comprised a microcontroller (Arduino), an HC-05 Bluetooth module, and an LCD/LED display. Messages sent from a Bluetooth-enabled mobile device using a

serial terminal app were received and displayed accurately on the board.

The display updated instantly upon receiving new messages, demonstrating real-time message handling without any manual interaction. The

Bluetooth connection was stable within the typical operational range of approximately 10 meters. The system reliably displayed messages of varying lengths and content, confirming its effectiveness as a modern alternative to conventional notice boards.

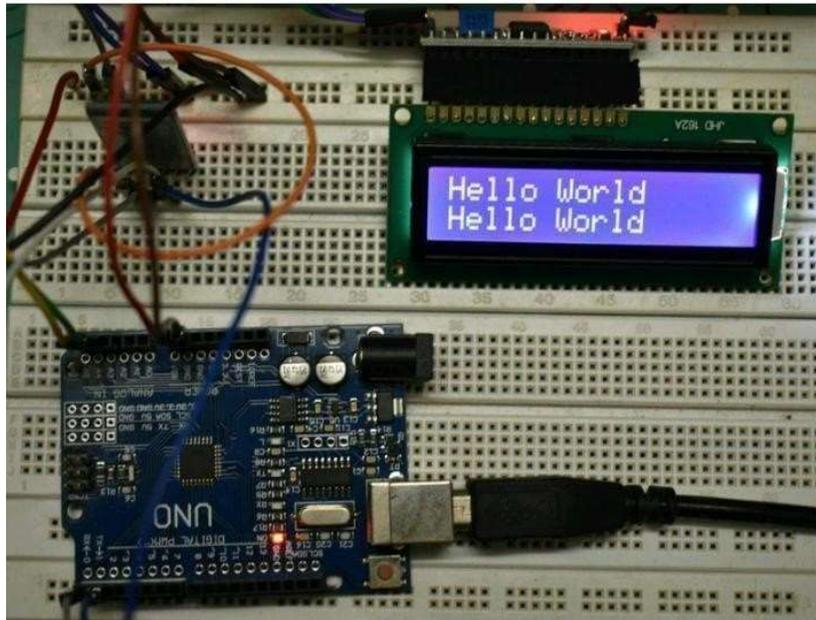


Figure 13: LCD displaying the received message.

The results indicate that the proposed wireless notice board is a practical solution for short-range communication, enabling seamless message updates and reducing the need for physical intervention.

Conclusion

The Bluetooth-based Wireless Notice Board provides an effective and convenient solution for modern communication requirements in educational institutions, offices, and public areas. By eliminating the need for manual updates, the system enables remote message posting through a smartphone interface. The successful implementation demonstrates the capability of low-cost embedded systems to facilitate real-time information sharing. The system operated reliably within its expected range, delivered instant message updates, and proved suitable for short-distance applications. Overall, the project achieves its goal of offering a smarter alternative to traditional notice boards, combining straightforward hardware with wireless technology for enhanced usability and efficiency.

Future Scope

Although the current system meets basic messaging needs, several enhancements can improve its functionality and versatility:

1. **Extended Connectivity:** Replacing the Bluetooth module with Wi-Fi or GSM can increase the

communication range and enable remote message updates from any location.

2. **Scheduled Messaging:** Integration of a real-time clock (RTC) allows time-based automated message updates.
3. **Smart Display Features:** Incorporating sensors, such as motion or temperature sensors, can transform the notice board into a smart, context-aware display system.
4. **Mobile Application Development:** A dedicated mobile app with enhanced UI, message history, user authentication, and notifications can improve usability and security.
5. **Accessibility Enhancements:** Adding multi-language support and voice-to-text functionality would make the system more user-friendly and inclusive.

These improvements can expand the applicability of the wireless notice board, transforming it from a simple messaging system into a comprehensive, intelligent communication platform suitable for diverse environments.

References

1. S. A. Patil and P. R. Patil, "Wireless notice board using Bluetooth technology," *International Journal of Engineering Research and Technology (IJERT)*, vol. 2, no. 11, pp. 1-3, Nov. 2013.

2. R. Kaur and M. Kaur, "Android based wireless notice board," *International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCCE)*, vol. 4, no. 2, pp. 253–256, Feb. 2016.
3. V. P. Dhavale, S. N. Mane, and A. N. Vibhute, "Smart wireless notice board," *International Journal of Scientific Engineering and Research (IJSER)*, vol. 3, no. 6, pp. 77–79, Jun. 2015.
4. HC-05 Bluetooth Module Datasheet. [Online]. Available: <https://components101.com/wireless/hc-05-bluetooth-module>
5. Arduino Documentation, "Arduino Uno board specifications," [Online]. Available: <https://www.arduino.cc/en/Main/arduinoBoardUno>
6. N. P. Jain and S. R. Jain, "GSM based e-notice board: Wireless communication," *International Journal of Advanced Research in Computer and Communication Engineering*, vol. 3, no. 2, pp. 5892–5895, Feb. 2014.
7. D. Zope and P. M. Chawan, "Real-time digital notice board using GSM modem," *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)*, vol. 4, no. 3, pp. 813–816, Mar. 2015.
8. M. S. Joshi and D. P. Khandagle, "Smart notice board," *International Research Journal of Engineering and Technology (IRJET)*, vol. 3, no. 5, pp. 2303–2305, May 2016.